	Application No.	Applicant(s)
Office Action Summary	10/597,874	BLAFFERT ET AL.
	Examiner	Art Unit
	NIRAV G. PATEL	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _17 June 2011_.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-20_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-20_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments filed 6/17/2011 have been fully considered but they are

not persuasive.

Regarding Claims 1 and 9, the applicants assert that a) the overly broad

interpretation of the term "relevant" by the Examiner is inappropriate and Ko

needs to disclose only those area which are relevant to trend control of lung

tumors.

Examiner's Response – a) the applicants agree that Ko teaches the

"predetermined task" is trend control of lung tumors by identifying lung

nodules (Page 1 of Remarks filed 6/17/2011, last paragraph). In

performing this predetermined task, Ko teaches that the centroid of the

lung and trachea are determined, which are used to perform the

registering along with the centroid of the lungs (Figure 3). The reason for

using the centroid of the trachea during the registration is given by Ko as

used to adjust the search area for corresponding nodules (Page 270, Col.

1, Lines 7-22). Thus, registering the trachea is considered relevant as it is

used for the purposes of the predetermined task, identifying lung nodules

in trend control of lung tumors. The applicants pointed out on Page 2 of

Remarks filed, end of the first full paragraph, that the image areas used

solely for purposes of registration are not "relevant" to the predetermined

task, and as such, it is shown that Ko uses the trachea not just for

registration, but identification of nodules, thus based on the applicant's

definition provided by the remarks, registration of the trachea is

considered relevant, meeting the limitations of the claim as recited.

Regarding Claim 18, the applicants assert that a) Ko discusses a user manually

identifying lung apices in an image, so that the selection is done with

consideration of the image, which is in direct contradiction of the claim language.

Examiner's Response – a) the invention of Ko is directed to trend control

of lung tumors by identifying lung nodules, as the applicants summarized

on Page 1 of the Remarks filed 6/17/2011. Thus the user utilizing the

invention of Ko, which is preconfigured to identifying lungs, trachea and

nodules, reads on the limitation of the claim language requiring the

selection of one or more object constituents without considering the

image. In other words, as put in an interview on 12/17/2009, the claim

requires a user to determine what they want to register before even any

images are displayed/viewed. As such, the user of Ko's invention knows

that the invention is directed to analyzing lungs, tracheas and nodules.

The act of utilizing the invention signals that the user has selected the

lung, trachea and nodules as the object constituents to be registered

without viewing any images (prior to loading the studies). Thus, it is

believed that Ko teaches the limitations of claim 18 and the rejection is

maintained.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3.   Claims 1, 9 18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated

by Ko et al. ("Chest CT: Automated Nodule Detection and Assessment of Change Over

Time-Preliminary Experience," "Ko").

      1) Regarding Claim 1, Ko teaches a data processing unit for registering a first

image and a second image of an object in order to perform a predetermined task with

the registered images (Page 267, Col. 2, Lines 31-39: The system detects pulmonary nodules within

CT images, thus the predetermined task is detecting nodules within the lung), the data processing

unit being set up to: segment the images automatically into various object constituents

(Page 269, Cols 1, 2, & 3, Sections titled "Thorax and lung border detection," "Lung border correction and

parenchymal detection": The system automatically determines the locations of the lungs and thorax

(which includes the trachea) and then continues to find their boundaries from the volume of the acquired

data, and isolating them, seen in Figure 2, thus segmenting the image into various object constituents);

register only those image areas associated with object constituents which are

relevant to the predetermined task, wherein the object constituents to be registered are

selected independently from the first image and the second image (Page 270, Col. 1,

Section titled "Analysis of consecutive CT sections with three-dimensional techniques": Using images that

depict trachea (object constituent which was automatically segmented, see previous limitation), the

centroids are calculated and used to register the images, thus the centroid of the trachea (object

constituent) is registered, the trachea relevant to identifying the nodules within the lung as it helps

identifying the lung (where the nodules are located). These centroids are selected independently as the

trachea is selected in each image, and then registered).

2) Regarding Claim 9, Ko teaches a method for registering a first image and a

second image of an object in order to perform a predetermined task with the registered

images, comprising the following steps: automatic segmentation of the images into

various object constituents (Page 269, Cols 1, 2, & 3, Sections titled "Thorax and lung border

detection," "Lung border correction and parenchymal detection": The system automatically determines the

locations of the lungs and thorax and then continues to find their boundaries from the volume of the

acquired data, and isolating them, seen in Figure 2, thus segmenting the image into various object

constituents);

registration of the image areas associated with object constituents relevant to the

predetermined task, wherein the object constituents to be registered are selected

independently from the first image and the second image (Page 270, Col. 1, Section titled

"Analysis of consecutive CT sections with three-dimensional techniques": The images that depicted the

trachea (constituent relevant to the task), the centroids were calculated and registered from images,

which is independently, as the trachea is selected in each image, and then registered).

3) Regarding Claim 18, Ko teaches a method for a user to use a data

processing unit to register a first image and a second image of an object, the method

comprising: the user selecting one or more object constituents to be registered without

consideration of the first image or the second image, the selected object constituents

being relevant to a predetermined task, and the user inputting the selection into the data

processing unit (Page 267, Col. 1, Lines 1-15: The system automatically identifies nodules at chest CT

images. Thus the system is designed to automatically register lungs, trachea to automatically identify the

nodules (Page 270, Col. 1, Section titled "Analysis of consecutive CT sections with three-dimensional

techniques"). Therefore, the user turning on/operating the system, inputs to the data processing unit

(computer vision system) that the lungs, trachea are to be registered);

the data processing unit being set up to automatically segment the first image

and the second image into one or more object constituents, and then to register only the

selected object constituents (Page 269, Cols 1, 2, & 3, Sections titled "Thorax and lung border

detection," "Lung border correction and parenchymal detection": The system automatically determines the

locations of the lungs and thorax and then continues to find their boundaries from the volume of the

acquired data, and isolating them, seen in Figure 2, thus segmenting the image into various object

constituents. Page 270, Col. 1, Section titled "Analysis of consecutive CT sections with three-dimensional

techniques": The images that depicted the trachea within the lung region section (constituent relevant to

the task), the centroids were calculated and registered from images, which is independently, as the

trachea is selected in each image, and then registered).

4) Regarding Claim 20, Ko teaches a method for registering a first image and a

second image of an object in order to perform a predetermined task with the registered

images, comprising the following steps:

automatic segmentation of the images into various object constituents (Page 269,

Cols 1, 2, & 3, Sections titled "Thorax and lung border detection," "Lung border correction and

parenchymal detection": The system automatically determines the locations of the lungs and thorax and

then continues to find their boundaries from the volume of the acquired data, and isolating them, seen in

Figure 2, thus segmenting the image into various object constituents);

registration only of the image areas associated with object constituents which are

required to perform the predetermined task, wherein the object constituents to be

registered are selected independently from the first image and the second image (Page

270, Col. 1, Section titled "Analysis of consecutive CT sections with three-dimensional techniques": Using

images that depict trachea (object constituent which was automatically segmented, see previous

limitation), the centroids are calculated and used to register the images, thus the centroid of the trachea

(object constituent) is registered, the trachea relevant to identifying the nodules within the lung as it helps

identifying the lung (where the nodules are located). These centroids are selected independently as the

trachea is selected in each image, and then registered. The registration of the trachea is required to

perform the predetermined task as it used to search for the nodules (Page 270, Col. 1, Lines 7-22)).

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 2 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Ko in view of Sofia Totterman et al. (U.S. Pub. No.: 2003/0072479, "Sofia Totterman").

1) Regarding Claim 2, while Ko teaches the limitations of claim 1, he fails to explicitly teach registering the image areas of various object constituents using individually assigned registration methods.

However, in the same field of medical image analysis, Sofia Totterman teaches registering the image areas of various object constituents using individually assigned registration methods (Paragraph 69: the approach of the present invention takes into account the local deformations of soft tissues by using a priori knowledge (registration method) of the material properties of the different structures found in the image segmentation. Also, different strategies (registration methods) can be applied to the motion of the rigid structures and to that of the soft tissues to register the image areas).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the registration methods taught by Sofia Totterman in place of the registration step of Ko. The determination of obviousness is predicated upon the following findings: one skilled in the art would have been motivated to modify Ko in this manner because segmenting images automatically, using individually assigned registration methods allows for the images to be grouped off so that another process or user may discard the groups which are considered irrelevant to the examination of the images or noise. Furthermore, the prior art collectively includes each element claimed (though not all in the same reference), and one of ordinary skill in the art could have combined the elements in the manner explained above using known engineering design, interface and/or programming techniques, without changing a "fundamental" operating principle of Ko, while the teaching of Sofia Totterman continues to perform the same function as originally taught prior to being combined, in order to produce the

repeatable and predictable result of performing image registration using individually assigned registration methods. It is for at least the aforementioned reasons that the examiner has reached a conclusion of obviousness with respect to the claim in question.

2) Regarding Claim 10, while Ko teaches the limitations of claim 9, he fails to explicitly teach registering the image areas of various object constituents using individually assigned registration methods.

However, in the same field of medical image analysis, Sofia Totterman teaches registering the image areas of various object constituents using individually assigned registration methods (Paragraph 69: the approach of the present invention takes into account the local deformations of soft tissues by using a priori knowledge (registration method) of the material properties of the different structures found in the image segmentation. Also, different strategies (registration methods) can be applied to the motion of the rigid structures and to that of the soft tissues to register the image areas).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the registration methods taught by Sofia Totterman in place of the registration step of Ko. The determination of obviousness is predicated upon the following findings: one skilled in the art would have been motivated to modify Ko in this manner because segmenting images automatically, using individually assigned registration methods allows for the images to be grouped off so that another process or user may discard the groups which are considered irrelevant to the examination of the images or noise. Furthermore, the prior art collectively includes each element claimed (though not all in the same reference), and one of ordinary skill in the art could have

combined the elements in the manner explained above using known engineering

design, interface and/or programming techniques, without changing a "fundamental"

operating principle of Ko, while the teaching of Sofia Totterman continues to perform the

same function as originally taught prior to being combined, in order to produce the

repeatable and predictable result of performing image registration using individually

assigned registration methods. It is for at least the aforementioned reasons that the

examiner has reached a conclusion of obviousness with respect to the claim in

question.

6.   Claims 3, 5, 6, 11, 13 and 14 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Ko in view of Zhao et al. ("Directional Edge Registration for Temporal

Chest Image Subtraction," "Zhao").

     1) Regarding Claim 3, while Ko teaches the limitations of claim 1, he fails to

explicitly teach segmented object constituents are automatically classified.

     However, in the same field of medical image analysis, Zhao teaches segmented

object constituents are automatically classified (Part II, Section C: "Ribs extraction and

Boundary detection," Lines 1 - 3: a set of rule base (reasoning) algorithms to identify rib edges was

developed. The lung and heart boundaries were extracted using an invert umbrella filter. Both methods

are automatic to classify objects and extract them).

     It would have been obvious at the time the invention was made to one of ordinary

skill in the art to use the teachings of Zhao to classify the constituents after they are

segmented by Ko. The determination of obviousness is predicated upon the following

findings: one skilled in the art would have been motivated to modify Ko in this manner because automatically classifying the segmented images provides an efficient way to take segmented images and determine if they contain wanted data or unwanted data. This would allow for a conclusion to be made of the data which has been segmented. Furthermore, the prior art collectively includes each element claimed (though not all in the same reference), and one of ordinary skill in the art could have combined the elements in the manner explained above using known engineering design, interface and/or programming techniques, without changing a "fundamental" operating principle of Ko, while the teaching of Zhao continues to perform the same function as originally taught prior to being combined, in order to produce the repeatable and predictable result of analyzing segmented objects to generate a classification. It is for at least the aforementioned reasons that the examiner has reached a conclusion of obviousness with respect to the claim in question.

2) Regarding Claim 5, while Ko teaches the limitations of claim 1, he fails to explicitly teach the limitations of claim 5.

However, in the same field of medical image analysis, Zhao teaches a first image and/or the second image are/is (a) two- or three-dimensional computer tomogram(s), in particular an X-ray photograph or a magnetic resonance image (Abstract: Temporal chest radiographs (2D X-ray) were used in a directional filtering technique).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the medical images that are acquired by Zhao, and then continue to perform the segmenting and registering steps as taught by Ko. The determination of

obviousness is predicated upon the following findings: one skilled in the art would have

been motivated to modify Ko in this manner because acquiring 2D or 3D x-rays or

magnetic resonance images (MRI) is a way to acquire images of a patient's internal

organs which is not invasive. Furthermore, the prior art collectively includes each

element claimed (though not all in the same reference), and one of ordinary skill in the

art could have combined the elements in the manner explained above using known

engineering design, interface and/or programming techniques, without changing a

"fundamental" operating principle of Ko, while the teaching of Zhao continues to perform

the same function as originally taught prior to being combined, in order to produce the

repeatable and predictable result of acquiring medical images that are either two- or

three-dimensional computer tomograms. It is for at least the aforementioned reasons

that the examiner has reached a conclusion of obviousness with respect to the claim in

question.

   3) Regarding Claim 6, while Ko teaches the limitations of claim 1, he fails to

explicitly teach the limitations of claim 6.

   However, in the same field of medical image analysis, Zhao teaches an object is

the chest of a patient, the lungs being the object constituent relevant to a tumor

diagnosis (Abstract: Normal chest structures (ribs, hear, and other normal lung structures) were

reduced due to this technique, therefore the regions of the lung were tumors are present were not

reduced).

   It would have been obvious at the time the invention was made to one of ordinary

skill in the art to acquire images of a patient's chest which is then segmented as taught

by Ko, and then registering the lungs in the patient's chest as those objects which are relevant to be registered. The determination of obviousness is predicated upon the following findings: one skilled in the art would have been motivated to modify Ko in this manner because imaging the chest allows for the lungs of a patient to be imaged so that a diagnosis can be made concerning the presence of tumors. Furthermore, the prior art collectively includes each element claimed (though not all in the same reference), and one of ordinary skill in the art could have combined the elements in the manner explained above using known engineering design, interface and/or programming techniques, without changing a "fundamental" operating principle of Ko, while the teaching of Zhao continues to perform the same function as originally taught prior to being combined, in order to produce the repeatable and predictable result of identifying lungs and nodules within acquired medical images. It is for at least the aforementioned reasons that the examiner has reached a conclusion of obviousness with respect to the claim in question.

4) Regarding Claim 11, while Ko teaches the limitations of claim 9, he fails to explicitly teach segmented object constituents are automatically classified.

However, in the same field of medical image analysis, Zhao teaches segmented object constituents are automatically classified (Part II, Section C: "Ribs extraction and Boundary detection," Lines 1 - 3: a set of rule base (reasoning) algorithms to identify rib edges was developed. The lung and heart boundaries were extracted using an invert umbrella filter. Both methods are automatic to classify objects and extract them).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the teachings of Zhao to classify the constituents after they are

segmented by Ko. The determination of obviousness is predicated upon the following

findings: one skilled in the art would have been motivated to modify Ko in this manner

because automatically classifying the segmented images provides an efficient way to

take segmented images and determine if they contain wanted data or unwanted data.

This would allow for a conclusion to be made of the data which has been segmented.

Furthermore, the prior art collectively includes each element claimed (though not all in

the same reference), and one of ordinary skill in the art could have combined the

elements in the manner explained above using known engineering design, interface

and/or programming techniques, without changing a "fundamental" operating principle

of Ko, while the teaching of Zhao continues to perform the same function as originally

taught prior to being combined, in order to produce the repeatable and predictable result

of analyzing segmented objects to generate a classification. It is for at least the

aforementioned reasons that the examiner has reached a conclusion of obviousness

with respect to the claim in question.

5) Regarding Claim 13, while Ko teaches the limitations of claim 9, he fails to

explicitly teach the limitations of claim 13.

However, in the same field of medical image analysis, Zhao teaches one of the

first image and the second image is a two- or three-dimensional computer tomogram

(Abstract: Temporal chest radiographs (2D X-ray) were used in a directional filtering technique).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to use the medical images that are acquired by Zhao, and then continue

to perform the segmenting and registering steps as taught by Ko. The determination of

obviousness is predicated upon the following findings: one skilled in the art would have

been motivated to modify Ko in this manner because acquiring 2D or 3D x-rays or

magnetic resonance images (MRI) is a way to acquire images of a patient's internal

organs which is not invasive. Furthermore, the prior art collectively includes each

element claimed (though not all in the same reference), and one of ordinary skill in the

art could have combined the elements in the manner explained above using known

engineering design, interface and/or programming techniques, without changing a

"fundamental" operating principle of Ko, while the teaching of Zhao continues to perform

the same function as originally taught prior to being combined, in order to produce the

repeatable and predictable result of acquiring medical images that are either two- or

three-dimensional computer tomograms. It is for at least the aforementioned reasons

that the examiner has reached a conclusion of obviousness with respect to the claim in

question.

6) Regarding Claim 14, while Ko teaches the limitations of claim 9, he fails to

explicitly teach the limitations of claim 14.

However, in the same field of medical image analysis, Zhao teaches an object is

the chest of a patient, and the predetermined task is tumor diagnosis in a lung of the

patient (Abstract: Normal chest structures (ribs, hear, and other normal lung structures) were reduced

due to this technique, therefore the regions of the lung were tumors are present were not reduced).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to acquire images of a patient's chest which is then segmented as taught

by Ko, and then registering the lungs in the patient's chest as those objects which are

relevant to be registered. The determination of obviousness is predicated upon the

following findings: one skilled in the art would have been motivated to modify Ko in this

manner because imaging the chest allows for the lungs of a patient to be imaged so that

a diagnosis can be made concerning the presence of tumors. Furthermore, the prior art

collectively includes each element claimed (though not all in the same reference), and

one of ordinary skill in the art could have combined the elements in the manner

explained above using known engineering design, interface and/or programming

techniques, without changing a "fundamental" operating principle of Ko, while the

teaching of Zhao continues to perform the same function as originally taught prior to

being combined, in order to produce the repeatable and predictable result of identifying

lungs and nodules within acquired medical images. It is for at least the aforementioned

reasons that the examiner has reached a conclusion of obviousness with respect to the

claim in question.

7.   Claims 4, 12, 16 and 17 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Ko in view of Kawata et al. ("Tracking interval changes of pulmonary

nodules using a sequence of three-dimensional thoracic images," "Kawata").

        1) Regarding Claim 4, while Ko teaches the limitations of claim 1, he fails to

explicitly teach a linear registration is performed on several resolution levels, rigid

bodies being registered on a coarse grid followed by affine registration on a finer grid.

        However, in the same field of medical image analysis, Kawata teaches a linear

registration is performed on several resolution levels (Abstract Lines 1 – 2: a computerized

approach to characterize pulmonary nodules through quantitative analysis between sequential 3-D

thoracic images is developed), rigid bodies being registered on a coarse grid (Abstract Lines 2 –

3: the registration procedure of sequential 3-D pulmonary images consisted of two transformation steps:

the rigid transformation step between two sequential 3-D thoracic CT image, which is on a coarse grid as

the next step involves a finer grid) followed by affine registration on a finer grid (Abstract Lines 2

– 4: the registration procedure of sequential 3-D pulmonary images consisted of two transformation steps:

the affine transformation step between two sequential region-of-interest (ROI) images including the

pulmonary nodule, this is on a finer grid).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the linear registration techniques taught by Kawata on the

relevant object constituents which have been segmented by Ko. The determination of

obviousness is predicated upon the following findings: one skilled in the art would have

been motivated to modify Ko in this manner because registering rigid bodies on a

coarse grid allows for objects not of interest, such as ribs, arteries, veins and other

irrelevant imaged bodies to be identified without the need to finely define their

boundaries due to the fact that they are not of concern. Performing an affine registration

on a finer grid allows for regions of interest to be registered with high level of accuracy

so that a proper diagnosis can be made. Furthermore, the prior art collectively includes

each element claimed (though not all in the same reference), and one of ordinary skill in

the art could have combined the elements in the manner explained above using known

engineering design, interface and/or programming techniques, without changing a

"fundamental" operating principle of Ko, while the teaching of Kawata continues to

perform the same function as originally taught prior to being combined, in order to

produce the repeatable and predictable result of performing registration on image

medical data. It is for at least the aforementioned reasons that the examiner has

reached a conclusion of obviousness with respect to the claim in question.

2) Regarding Claim 12, while Ko teaches the limitations of claim 9, he fails to

explicitly teach a linear registration is performed on several resolution levels, rigid

bodies being registered on a coarse grid followed by affine registration on a finer grid.

However, in the same field of medical image analysis, Kawata teaches a linear

registration is performed on several resolution levels (Abstract Lines 1 – 2: a computerized

approach to characterize pulmonary nodules through quantitative analysis between sequential 3-D

thoracic images is developed), rigid bodies being registered on a coarse grid (Abstract Lines 2 –

3: the registration procedure of sequential 3-D pulmonary images consisted of two transformation steps:

the rigid transformation step between two sequential 3-D thoracic CT image, which is on a coarse grid as

the next step involves a finer grid) followed by affine registration on a finer grid (Abstract Lines 2

– 4: the registration procedure of sequential 3-D pulmonary images consisted of two transformation steps:

the affine transformation step between two sequential region-of-interest (ROI) images including the

pulmonary nodule, this is on a finer grid).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the linear registration techniques taught by Kawata on the

relevant object constituents which have been segmented by Ko. The determination of

obviousness is predicated upon the following findings: one skilled in the art would have

been motivated to modify Ko in this manner because registering rigid bodies on a

coarse grid allows for objects not of interest, such as ribs, arteries, veins and other

irrelevant imaged bodies to be identified without the need to finely define their

boundaries due to the fact that they are not of concern. Performing an affine registration

on a finer grid allows for regions of interest to be registered with high level of accuracy

so that a proper diagnosis can be made. Furthermore, the prior art collectively includes

each element claimed (though not all in the same reference), and one of ordinary skill in

the art could have combined the elements in the manner explained above using known

engineering design, interface and/or programming techniques, without changing a

"fundamental" operating principle of Ko, while the teaching of Kawata continues to

perform the same function as originally taught prior to being combined, in order to

produce the repeatable and predictable result of performing registration on image

medical data. It is for at least the aforementioned reasons that the examiner has

reached a conclusion of obviousness with respect to the claim in question.

3) Regarding Claim 16, while Ko teaches the limitations of claim 9, he fails to

explicitly teach the registration is one of a rigid body transformation, an affine

transformation, and a non-linear spline function.

However, in the same field of endeavor, Kawata teaches the registration is one of

a rigid body transformation, an affine transformation, and a non-linear spline function

(Abstract Lines 1-3: A computerized approach to characterize pulmonary nodules through quantitative

analysis between sequential 3-D thoracic images is developed. The registration procedure of sequential

3-D pulmonary images consisted of two transformation steps: the rigid transformation step between two

sequential 3-D thoracic CT images, which are on a coarse grid as the next step involves a finer grid).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the registration of Ko's object constituents using the rigid body

transformation as taught by Kawata. The determination of obviousness is predicated

upon the following findings: one skilled in the art would have been motivated to modify

Ko in this manner because registering rigid bodies on a coarse grid allows for objects

not of interest, such as ribs, arteries, veins and other irrelevant imaged bodies to be

identified without the need to finely define their boundaries due to the fact that they are

not of concern. Performing an affine registration on a finer grid allows for regions of

interest to be registered with high level of accuracy so that a proper diagnosis can be

made. Furthermore, the prior art collectively includes each element claimed (though not

all in the same reference), and one of ordinary skill in the art could have combined the

elements in the manner explained above using known engineering design, interface

and/or programming techniques, without changing a "fundamental" operating principle

of Ko, while the teaching of Kawata continues to perform the same function as originally

taught prior to being combined, in order to produce the repeatable and predictable result

of performing a rigid body transformation on image data as a registration method. It is

for at least the aforementioned reasons that the examiner has reached a conclusion of

obviousness with respect to the claim in question.

4) Regarding Claim 17, while Ko teaches the limitations of claim 1, he fails to

explicitly teach the registration is one of a rigid body transformation, an affine

transformation, and a non-linear spline function.

However, in the same field of endeavor, Kawata teaches the registration is one of

a rigid body transformation, an affine transformation, and a non-linear spline function

(Abstract Lines 1-3: A computerized approach to characterize pulmonary nodules through quantitative

analysis between sequential 3-D thoracic images is developed. The registration procedure of sequential

3-D pulmonary images consisted of two transformation steps: the rigid transformation step between two

sequential 3-D thoracic CT images, which are on a coarse grid as the next step involves a finer grid).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the registration of Ko's object constituents using the rigid body

transformation as taught by Kawata. The determination of obviousness is predicated

upon the following findings: one skilled in the art would have been motivated to modify

Ko in this manner because registering rigid bodies on a coarse grid allows for objects

not of interest, such as ribs, arteries, veins and other irrelevant imaged bodies to be

identified without the need to finely define their boundaries due to the fact that they are

not of concern. Performing an affine registration on a finer grid allows for regions of

interest to be registered with high level of accuracy so that a proper diagnosis can be

made. Furthermore, the prior art collectively includes each element claimed (though not

all in the same reference), and one of ordinary skill in the art could have combined the

elements in the manner explained above using known engineering design, interface

and/or programming techniques, without changing a "fundamental" operating principle

of Ko, while the teaching of Kawata continues to perform the same function as originally

taught prior to being combined, in order to produce the repeatable and predictable result

of performing a rigid body transformation on image data as a registration method. It is

for at least the aforementioned reasons that the examiner has reached a conclusion of

obviousness with respect to the claim in question.

8.   Claims 7, 8 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Ko in view of Kuhnigk (U.S. Pub. No.: 2005/0196024).

1) Regarding Claim 7, while Ko teaches the limitations of claim 1, he fails to

explicitly teach segmentation is performed using a watershed transformation.

However, in the same field of medical image analysis, Kuhnigk teaches

segmentation is performed using a watershed transformation (Paragraph 29: segmentation is

performed by means of a watershed transformation).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the segmentation step of Ko using the watershed

transformation as taught by Kuhnigk. The determination of obviousness is predicated

upon the following findings: one skilled in the art would have been motivated to modify

Ko in this manner because performing a segmentation using a watershed

transformation allows for segmentation based on topology, so that areas of interest are

segmented properly and do not loose relevant information. Furthermore, the prior art

collectively includes each element claimed (though not all in the same reference), and

one of ordinary skill in the art could have combined the elements in the manner

explained above using known engineering design, interface and/or programming

techniques, without changing a "fundamental" operating principle of Ko, while the

teaching of Kuhnigk continues to perform the same function as originally taught prior to

being combined, in order to produce the repeatable and predictable result of

segmenting an medical image. It is for at least the aforementioned reasons that the

examiner has reached a conclusion of obviousness with respect to the claim in

question.

2) Regarding Claim 8, while Ko teaches the limitations of claim 1, he fails to

explicitly teach an imaging device for producing images of an object; and a data

processing unit as claimed in claim 1, coupled to the imaging device.

However, in the same field of medical image analysis, Kuhnigk teaches an

imaging device for producing images of an object (Paragraph 40: three dimensional lung image

data is acquired by computer tomography, nuclear magnetic resonance tomography or by means of

another image modality); and

a data processing unit as claimed in claim 1, coupled to the imaging device

(Figure 2: Computer system 200 (data processing unit) is coupled to the image data acquisition system

202 (imaging device), also see analysis of claim 1, where Ko teaches the use of a computer vision

system (Page 269, Col. 1, "Computer vision system"))).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to connect a medical imaging device, as taught by Kuhnigk, to the data

processing unit of Ko such that images can be acquired and processed. The

determination of obviousness is predicated upon the following findings: one skilled in

the art would have been motivated to modify Ko in this manner because using an

imaging device such as nuclear magnetic resonance or computer tomography allows for

an image of chest region of a patient to be produced. Furthermore, the prior art

collectively includes each element claimed (though not all in the same reference), and

one of ordinary skill in the art could have combined the elements in the manner

explained above using known engineering design, interface and/or programming

techniques, without changing a "fundamental" operating principle of Ko, while the

teaching of Kuhnigk continues to perform the same function as originally taught prior to

being combined, in order to produce the repeatable and predictable result of acquiring

medical images which are processed by a computer. It is for at least the aforementioned

reasons that the examiner has reached a conclusion of obviousness with respect to the

claim in question.

3) Regarding Claim 15, while Ko teaches the limitations of claim 9, he fails to

explicitly teach segmentation is performed using a watershed transformation.

However, in the same field of medical image analysis, Kuhnigk teaches

segmentation is performed using a watershed transformation (Paragraph 29: segmentation is

performed by means of a watershed transformation).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to perform the segmentation step of Ko using the watershed

transformation as taught by Kuhnigk. The determination of obviousness is predicated

upon the following findings: one skilled in the art would have been motivated to modify

Ko in this manner because performing a segmentation using a watershed

transformation allows for segmentation based on topology, so that areas of interest are

segmented properly and do not loose relevant information. Furthermore, the prior art

collectively includes each element claimed (though not all in the same reference), and

one of ordinary skill in the art could have combined the elements in the manner

explained above using known engineering design, interface and/or programming

techniques, without changing a "fundamental" operating principle of Ko, while the

teaching of Kuhnigk continues to perform the same function as originally taught prior to being combined, in order to produce the repeatable and predictable result of segmenting an medical image. It is for at least the aforementioned reasons that the examiner has reached a conclusion of obviousness with respect to the claim in question.

9.   Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ko in view of Bullitt et al. (U.S. Pub. No.: 2007/0019846, "Bullitt").

) Regarding Claim 19, while Ko teaches the limitations of claim 18, he fails to explicitly teach wherein the data processing unit is further set up to register the selected object constituents using individually assigned registration methods.

However, in the same field of medical image analysis, Bullitt teaches wherein the data processing unit is further set up to register the selected object constituents using **individually assigned registration methods** (Paragraph 91: Various registration techniques are used, including a tissue-based correlation).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to configure Ko's data processing such that during the registration process, they are registered using individually assigned registration methods as taught by Bullitt. The determination of obviousness is predicated upon the following findings: one skilled in the art would have been motivated to modify Ko in this manner because using an tissue-based correlation registration method allows for use tissue structure (vessels in the lung) as a way of accurately registration structures in one image (one

study) to another image (second study) such that a precise comparison can be made in

Ko's teachings. Furthermore, the prior art collectively includes each element claimed

(though not all in the same reference), and one of ordinary skill in the art could have

combined the elements in the manner explained above using known engineering

design, interface and/or programming techniques, without changing a "fundamental"

operating principle of Ko, while the teaching of Bullitt continues to perform the same

function as originally taught prior to being combined, in order to produce the repeatable

and predictable result of registering object constituents in a medical image. It is for at

least the aforementioned reasons that the examiner has reached a conclusion of

obviousness with respect to the claim in question.

Conclusion

10.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to NIRAV G. PATEL whose telephone number is (571)270-

5812. The examiner can normally be reached on Monday - Friday 8 am - 5 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NIRAV G PATEL/
Examiner, Art Unit 2624

/Brian P. Werner/
Primary Examiner, Art Unit 2624